

TRANSGENIC ANIMALS FOR MONITORING WATER QUALITY

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ABSTRACT

[0086] The present invention provides methods and systems that uses transgenic zebrafish with an easily assessable reporter gene under the control of pollutant-inducible DNA response elements. Transgenic zebrafish, carrying pollution-inducible response elements, are placed in the water to be tested, and the contaminants become bioconcentrated (generally 1,000- to 40,000-fold, relative to the water) in the tissues of the fish thereby activating specific response elements, which up-regulate the *LUC* reporter gene. Fish are then removed from the test water and placed immediately in a luminometer cuvette and incubated with luciferin. Luciferin is rapidly taken up into the tissues of the fish, oxidized by luciferase, and light is produced. The luminescence is proportional to the environmental concentration of the pollutant (to which the fish had been exposed), which drives the expression of the *LUC* gene by means of the various DNA motifs. The luminescence is quantitated in the luminometer. In each response element-containing construct, a specific class of polluting chemicals, allowing for differential identification of pollutants in a complex mixture activates the expression of the *LUC* gene. This assay does not require killing the fish and allows for repeated analysis of the same site with the same fish. The sensitivity of the system can be manipulated by varying the sequence of the response element.